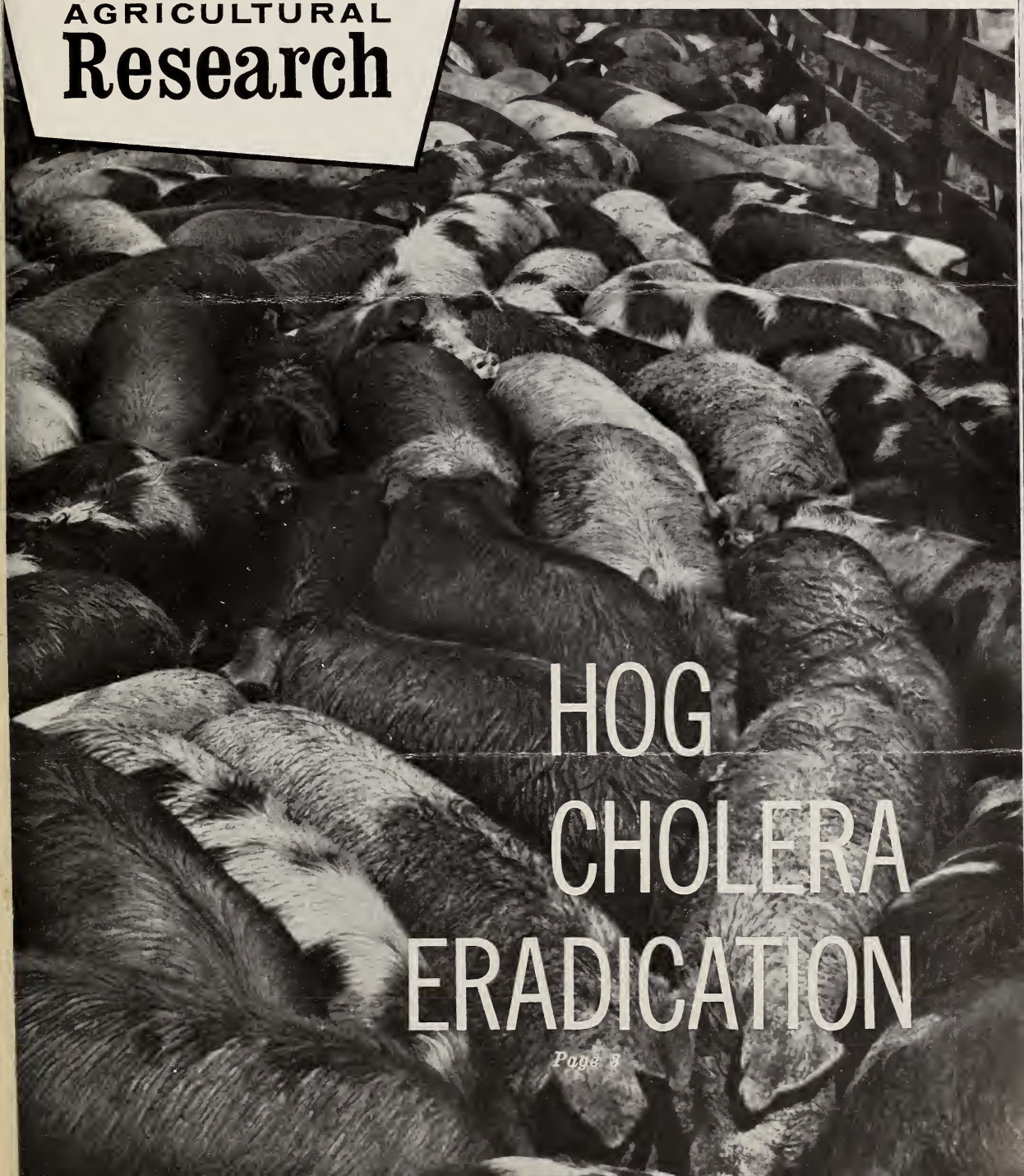
December 1961/U.S. Department of Agriculture

AGRICULTURAL Research



HOG CHOLERA ERADICATION

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AGRICULTURAL
Research

December 1961/Volume 10, No. 6

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Goals for Agriculture

To establish goals for U.S. agriculture, we must note two aspects of the scientific and technological revolution that dominates the age in which we live.

Science and technology have now progressed so far that we can foresee the physical possibilities of producing enough so that no one in the world need be in want of the material goods he needs.

Second, science and technology are linking the future of each individual to what happens in the rest of the world.

As a fundamental goal, we must continue to strive for production of primary goods to meet basic human needs. We must provide those who produce our abundance with a fair reward for the capital, labor, and managerial effort they invest. And we must concern ourselves with the resources for production in both the immediate and distant future.

How can we make maximum progress toward these goals?

- By mobilizing the resources of research, education, and public understanding that contributed so much to the outstanding success of agriculture during the last century.
- By using our superiority over the Communists in agricultural production as a propaganda weapon in nations that are seeking rapid economic growth and greatly in need of increased agricultural production.
- By sharing with other nations this country's technical know-how and its experience in our system of land ownership and operation and the kind of supervised credit that helps to make that kind of ownership effective.
- By expanding and intensifying efforts to use our abundance to help feed the hungry abroad until they are able to produce sufficiently.

The future, not only of agriculture, but of our entire civilization, may depend on how well we succeed in reaching our goals.

(Highlights from address by Secretary of Agriculture Orville L. Freeman, opening the USDA Graduate School Centennial Lecture Series.)

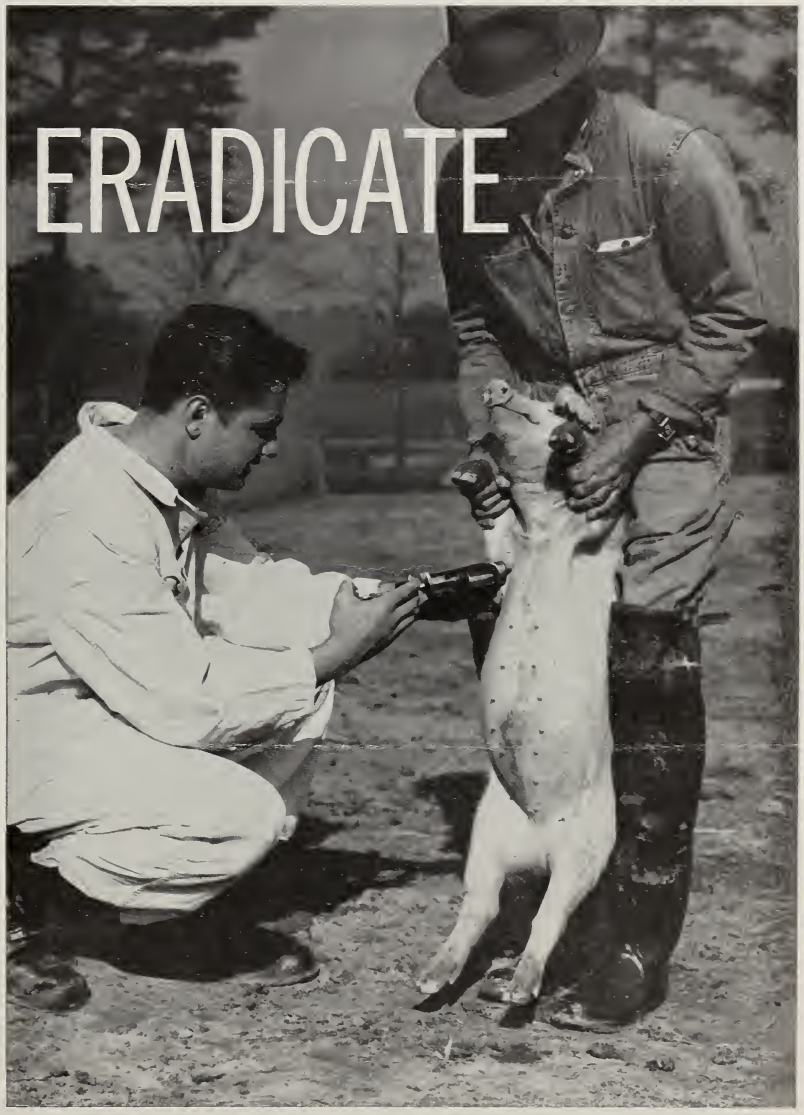
AGRICULTURAL RESEARCH is published monthly by the Agricultural Research Service, United States Department of Agriculture, Washington 25, D.C. Printing has been approved by the Bureau of the Budget, August 15, 1958. Yearly subscription rate is $1 in the U.S. and countries of the Postal Union, $1.50 in other countries. Single copies are 15 cents each. Subscription orders should be sent to Superintendent of Documents, Government Printing Office, Washington 25, D.C.

Growth Through Agricultural Progress

AGRICULTURAL RESEARCH SERVICE
United States Department of Agriculture

NEW EFFORT TO ERADICATE HOG CHOLERA

Veterinarian immunizes pig against hog cholera. Vaccination with licensed vaccines will be increased in areas where much cholera occurs.



■ A Federal-State campaign to eradicate hog cholera from the United States, authorized by Public Law 87–209, is getting underway.

Meat industry and swine producer groups and State agricultural officials have long sought a concerted program against the deadly, worldwide virus disease. It costs U.S. hog producers about $50 million a year in losses and prevention expenses. Immunization alone costs about 45¢ per pig marketed here, while in Canada, which has rid itself of this highly contagious disease, eradication has for the

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HOG CHOLERA

(Continued)

past 45 years cost about ½¢ per pig marketed.

A 12-member advisory committee headed by a USDA official will help to plan and develop the new program. Members will represent the swine industry, consumer groups, State and local governments, and professional and scientific organizations.

The new law also authorizes ARS to prohibit or restrict interstate movement of virulent hog cholera virus, sometimes used to inoculate pigs. Use of this virus is considered dangerous, because it can help to spread the disease; many States already ban or restrict its use.

In some States, legislatures have appropriated funds for participation in the program. In others, committees have been set up to decide if, when, and how fast their States will get into the program and how much supplementary Federal assistance will be needed.

Close cooperation between swine producers, State and local agencies, and ARS will enable best use of all the eradication tools now available to make and keep pigs cholera-free. Here are these tools.

For swine owners:

VACCINATION, with licensed vaccines, of every pig in the herd.

ISOLATION of replacement pigs until they are proved free of cholera.

SEGREGATION of swine quarters from visitors.

SANITATION of premises, vehicles, equipment, and workers' footwear, and the cooking of raw garbage fed to pigs—a measure already required in 46 States.

For Federal and State officials:

REGULATION of virus and of animal shipments within and across State lines, and inspection and quarantine where necessary.

CONDEMNATION, destruction, and proper disposal of infected and exposed animals, and payment of indemnities to owners.

INFORMATION, to the swine industry, on campaign progress, requirement of prompt reporting of new hog cholera outbreaks, and training of specialists in eradication techniques.

EXPLORATION through surveys, diagnosis, and traceback to infection sources, and research to improve eradication methods.

Hog cholera occurs in every State and in most other hog-producing countries, except Canada. Hog cholera restricts U.S. pork exports to about 69 million pounds a year. A potential foreign pork market twice this figure actually exists. Eleven countries now ban or restrict pork imports from the United States.

The disease presently occurs in cycles. Its incidence is now at a 13-year low, an ideal time to attempt eradication, according to ARS animal disease authorities.

Legislators who sponsored the new law anticipate that Federal expenditures will follow the usual pyramidal form of such campaigns—rising, leveling off, then falling—over a period of several years. But they believe total eradication expenditures would cost no more than $100 million, the present cost of living with the disease for 2 years.☆

If hogs show signs of cholera on arrival at public stockyard, they are segregated.

Healthy (top) vs. cholera-diseased hog kidney with hemorrhaged spots.

Inspector checks hog's temperature before vaccination at the stockyard.

Raw pork containing virus may be in garbage fed to hogs, so garbage is steam-cooked on trucks at the farm to destroy the virus.

Sponge wet with distilled water (left) is ignored, as termites cluster around one wet with extract of attractant.

Decayed wood yields first known

TERMITE ATTRACTANT

■ The first known termite attractant has been obtained from decayed wood and partially purified by USDA and Wisconsin entomologists. The substance was extracted from western pine infected by the brown rot fungus *Lenzites trabea.*

This material may eventually prove useful for locating termite infestations and developing methods of controlling the wood-devouring pests.

Discoverers of the attractant are G. R. Esenther of the Forest Products Laboratory, U.S. Forest Service, and T. C. Allen, J. E. Casida, and R. D. Shenefelt of the Wisconsin Agricultural Experiment Station, Madison. Their research was conducted with the cooperation and support of the city of Sheboygan and the Wisconsin Alumni Research Foundation.

Casida is now attempting to further purify the substance and to determine its chemical structure. Esenther and Allen are testing methods of using the attractant for termite control.

The scientists began their studies by giving termites a choice of sound wood or wood infected by various fungus species. Termites eat wood that is decayed by fungus infection.

Small blocks of wood were placed on moist sand in plastic containers, and 250 termites were scattered on the sand in each container. Within 2 minutes after the insects were released, the largest group gathered around wood infected by *L. trabea.*

Next, the entomologists made dilute water extracts from wood infected by *L. trabea.* These extracts, too, were effective attractants. Extracts made from uninfected wood or the fungus alone didn't get a response. After the substance was partially purified, as little as 0.1 microgram of it attracted the termites.

Insects used in the experiments were different forms (workers, soldiers, and nymphal reproductives) of the eastern subterranean termite, *Reticulitermes flavipes,* which attacks dead trees and wood in buildings. *Nasutitermes columbicus,* a Costa Rican termite, and *R. virginicus,* the dark, southern subterranean termite, also were greatly attracted by the substance.☆

Curved or angled spines seem to keep birds from eating grain sorghums developed by F. T. Boyd at Fort Lauderdale, Fla.

GRAIN SORGHUMS THAT REPEL BIRDS

Sharp spines growing from the seed coverings may hinder swallowing

■ Grain sorghums with bristled heads that repel grain-feeding birds are being evaluated by Florida and USDA scientists.

Growing from the glumes (seed coverings) of the test varieties are sharp awns or spines. These protective bayonet-like spines seem to keep birds from feeding. Just why, scientists are not sure; the awns may interfere with swallowing.

Some strains have already been test-grown successfully in south Florida. Tests now are being conducted at Beltsville, Md., in Mississippi, and other States. Researchers will try to cross sweet sorghums with the grain sorghum strains to learn if widely adaptable bird-repellent sweet sorghums can be produced. Bird-feeding on sorghums is a general problem throughout the South and Southwest.

Two years ago, agronomist F. T. Boyd, in charge of the Plantation Field Laboratory of the Florida Agricultural Experiment Station, Fort Lauderdale, discovered the bird-repellency characteristic during tests of hundreds of sorghum varieties. Blackbirds, rice birds, English sparrows, and Florida grackles left only two sorghum lines strictly alone.

These lines are Leoti Red from Texas—grown commercially in the Southwest—and Cuban Guinea from Cuba. By crossing them, Boyd has successfully developed some 50 strains with their own built-in bayonets. The strains are being shared with agronomist I. E. Stokes and his associates in ARS sugar-crops research.

Bitter tannin-like substances found in brown-seeded varieties have also been associated with bird resistance. Leoti Red is one of those with a high tannin content. However, the lighter-colored Cuban Guinea seeds may not contain such substances.

Awns also grow on other small grains

Several other small grains such as wheat and barley have awns. Boyd thinks many primitive sorghums may have possessed awns, and that they have been bred out of most commercial varieties to protect hand-harvesters from discomfort.

Leoti Red and Cuban Guinea have good foliage characteristics and are suitable for silage or soilage (cutting and feeding green to livestock). Boyd is working, however, to breed into them higher grain yield and greater disease resistance. He thinks they may have adaptability wherever sorghums are normally grown.

For many years it has been difficult to grow grain sorghums in south Florida, unless the crop was planted to mature when red-winged blackbirds and other birds were not destructive—during nesting, for example.

If the scientists can breed commercially acceptable awned varieties, seeds will be released to certified growers so supplies can be produced for general distribution. This may require several years.☆

CATTLEMEN PENALIZED BY UNDERFEEDING BEEF COWS

■ Cattlemen trying to save money by underfeeding their pregnant and lactating older cows usually are penalized three ways:

- Cows will produce lightweight calves.
- Many cows won't come in heat after calving.
- Of those cows that do come in heat, some may have a lower-than-normal conception rate.

This three-way loss was demonstrated when USDA and Nebraska Agricultural Experiment Station scientists underfed 6-year-old Hereford cows before and after calving. (In earlier tests, using younger cows, the researchers also proved these effects.)

Shortly after the mature cows had weaned their previous offspring, they were each fed 4.5 pounds of TDN (total digestible nutrients) per day until they calved again. Then for about 3 months they got 8 pounds of TDN daily. For comparison, a similar group was fed 9 pounds a day until calving, then 16 pounds—adequate diets.

Calves from the underfed group weighed about 11 pounds less at birth than calves from cows fed adequate rations. Only 4 of 18 underfed cows came in heat within 3 months after calving; all of the 20 cows fed sufficient diets came in heat during this time. Two underfed cows that came in heat failed to conceive when bred. All but one of those fed adequate diets conceived.

The study was conducted by ARS animal husbandman J. N. Wiltbank and associates. They worked at Fort Robinson, Nebr.

If feed supplies are short and cows must be underfed, it is best to conserve feed while cows are pregnant and to give normal rations after they calve. The scientists found that the conception rate of cows on such a feeding program was normal.

These animals conceived when bred, but required about 3 weeks longer to come in heat than cows fed adequate rations throughout the experiment.☆

Discovered: A DEADLY RANGE PLANT

■ An unpalatable range plant that grows in sandy and gravelly soil in Arizona, Nevada, Utah, and southern California has been proved deadly to sheep.

The plant (*Psathyrotes annua*) is a leafy, low-growing herb that doesn't have a common name.

It isn't known whether sheep on range have eaten the plant. Scientists learned about its toxicity by grinding mature plants and feeding them through stomach tubes.

USDA research veterinarian Wayne Binns and ARS associates, working in cooperation with the Utah Agricultural Experiment Station at Logan, found that less than 3 grams of the plant per pound of body weight killed sheep in 2 days.

One sheep fed the residue of a lethal dose of the ground plant (after water had been removed) wasn't affected. But another getting the water extract died 30 hours after feeding. This shows the plant's toxic substance is water soluble—useful knowledge to scientists attempting to isolate the substance.

After receiving lethal amounts of the plant, the animals got weak and depressed. Their heart beats quickened. They stood as long as possible, then fell to the ground in a coma. They died soon after, without struggling.

The sheeps' livers appeared to be most affected by the poisonous plant. The livers were swollen, congested, and mottled.

Losses aren't likely on pastures that provide good forage; sheep probably won't eat *Psathyrotes annua* if they can get enough palatable feed.

If poisoning occurs, a preventive is obvious: keep sheep off pastures containing the plant. Supplemental feeding—to prevent hunger—also should stop losses.☆

This plant thrives in dry creek beds in 4 Western States. It has a pungent odor. Its small yellow flowers turn purple at maturity.

An increasing number
of fruits and vegetables
are going to market

PREPACKED *For CONSUMERS*

■ More and more fresh fruits and vegetables are going from farm to market in packages for consumers.

Research by USDA's Agricultural Marketing Service shows there are good reasons why: Packaging by the grower or shipper (prepackaging) is the best way to preserve quality of many products. And the extra cost of prepackaging is often more than offset by savings gained from reduced transportation costs, waste and spoilage losses, and retail expenses. Retailers can afford to pay more for prepackaged produce, because this saves them the expense of packaging.

Moreover, according to AMS marketing specialist D. R. Stokes, prepackaging gives the grower-shipper an opportunity to develop and capitalize on a brand name.

Recent studies by Stokes and other researchers, in cooperation with growers, shippers, and manufacturers of packaging materials, show new ways to package produce and the advantages prepackaging offers.

Especially promising, for display and protection, are new shrinkable films, now used on some commodities and under test on others.

These films were evaluated in 1960 and 1961 on lettuce shipped from the West Coast to Eastern markets. Packers first trimmed the inedible wrapper leaves from heads, then placed individual heads in semi-moisture-proof, shrinkable film. Exposing the film for 3 seconds to 300° F. made it shrink tightly around the lettuce.

This method of packaging brings two benefits: Transportation costs are reduced, and the lettuce gets to retail stores and consumers with more of the vitamin-rich inner green leaves intact.

Industry is now trying commercial shipments, using this AMS-developed method of prepackaging lettuce.

Peaches, packed 4 pounds to a deep tray and overwrapped with perforated, shrinkable film, were test-shipped last summer. Tight shrinking of the film around the fruit kept it from moving, and bruising was almost eliminated. Forty-two shipments from South Carolina arrived in good condition in New York, Illinois, Massachusetts, Texas, Iowa, and Minnesota, among other States.

Shrinkable film was tried on pears by marketing specialists P. G. Chapogas and J. B. Fountain in Oregon and Washington in 1960. Pears were packed 5 to 8 to a molded pulpboard tray, then overwrapped with film. Forty carloads arrived in near-perfect condition in Eastern markets.

Results also were good on test shipments, from Washington to the East, of similarly packaged Winesap and Delicious apples.

Besides preventing discoloration and bruising, the shrinkable films added greatly to appearance and salability. These films reflect less light than other types of film and attract the buyer's eye to the product rather than to the package.

Shrinkable film highlights beauty of pears, keeps them free of blemishes.

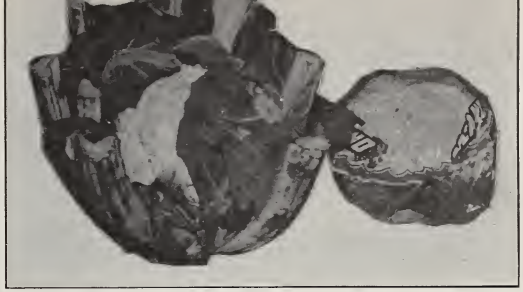
Marketing specialist P. W. Hale and Stokes evaluated prepackaged grapes during 1956–60. Grapes packed in 2-pound lots in California arrived in Eastern markets in better condition than grapes packed in bulk boxes. Packaging the grapes also protected them from damage by consumer handling in retail stores.

Trial shipments of green beans in ventilated cellophane bags, sent from Florida to New England and other Eastern markets, arrived in excellent condition and were readily accepted by consumers. These beans looked much better on display than beans in bulk.

In other tests, sweet corn was packed 5 ears to a tray and overwrapped with shrinkable film, but it was difficult to control temperature and moisture.

A study by marketing specialist J. L. Ginn of different ways to prepare and pack cauliflower for shipment from California showed that completely trimming and packaging heads is one of the least expensive. Fully trimmed cauliflower weighed nearly 70 percent less than partially trimmed heads shipped in bulk. Savings in freight charges were more than the cost of extra labor and packaging materials. About 90 percent of California-grown cauliflower is now shipped this way.

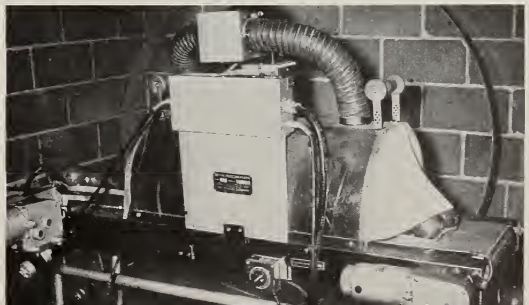
Tests of shrinkable films and other new consumer packages, packing methods, and shipping containers used for various fruits and vegetables and also dairy and poultry products are continuing.☆



Extra bulk, weight of untrimmed cauliflower (left) add to shipping costs; trimmed and wrapped head (right) stays fresher in store.

Apples (left), shipped in tray overwrapped with shrinkable film, have no bruises. Those at right were shipped in polyethylene bag.

Automatic machinery is available now, but in early tests, fruit was handwrapped with film (above). Brief exposure to heat (below) shrinks film, raises fruit temperature only slightly.



Plants from treated roots (left) are about 10 days ahead of those from untreated roots (right).

GAINS FROM HEAT-TREATING SWEETPOTATO ROOTS

Many more plants and transplanting earlier are among the advantages

Production (right) of treated roots was more than twice that of untreated roots (left).

Earlier and more prolific sprouting can be obtained from sweetpotatoes bedded for growing transplants if the roots are given a heat treatment, USDA scientists find.

This treatment increases the number of young plants produced from bedded stock and makes earlier transplanting possible. Labor costs are reduced, because fewer treated than untreated roots need to be handled. Since treated roots produce more plants, less bedding space is required.

In North Carolina, heat treatment enables growers to set out transplants up to 10 days earlier. It also reduces by 40 percent the amount of bedding stock needed. Only 15 bushels of heat-treated sweetpotatoes are required to produce enough transplants for an acre; 25 bushels of untreated stock are normally required.

The heat treatment consists of storing roots for 30 days at 85° F. in high humidity. This treatment, given just prior to bedding, forces earlier and more prolific sprouting. After the sprouts attain a length of 2 to 4 inches, whole roots are placed in outdoor beds and covered with soil and a plastic film. First plants may be pulled from the roots about 40 days later and transplanted to fields.

ARS horticulturist M. T. Deonier, Meridian, Miss., and AMS physiologist L. J. Kushman, Raleigh, N.C., developed the treatment. It is particularly promising for use on some of the newer high-quality sweetpotatoes such as Nugget and Goldrush. These new varieties produce fewer plants than Porto Rico and other older, normally prolific varieties.

Plant production has become a problem, because growers have shifted acreage from the older varieties and increased the number of plants per acre. These changes result in higher yields and more medium-sized sweetpotatoes preferred by consumers.☆

Rotation Helps Control Soybean Cyst Nematode

■ Normal soybean yields can be reasonably expected in fields infested by soybean cyst nematodes—if rotation with a nonhost crop is used, USDA-Tennessee research indicates.

This nematode has been found in more than 60,000 acres of soil in 8 States; infestation of a much larger acreage is suspected. The pest is capable of reducing soybean yields so the crop becomes unprofitable.

Although crop rotation does not eliminate the nematode, it prevents heavy yield losses that the pest can cause.

In studies by ARS nematologist J. M. Epps, in cooperation with the Tennessee Agricultural Experiment Station, soybean yields the third year of a soybean-cotton-soybean rotation were 36 percent larger than yields in the third year of continuous soybeans. Yields were 34 and 25 bushels per acre, respectively.

In other studies, yields in the third year of a soybean-sorghum-soybean rotation were 66 percent greater than in the third year of continuous soybeans. Yields were 35 and 21 bushels per acre. Bean production was not increased as much when fallow was substituted for sorghum. Yield after fallow was 27 bushels per acre, an increase of about 29 percent.

Yields were shown to be closely associated with the number of nematode larvae in the soil at the beginning of the growing season. The fewer the larvae at the beginning of the crop year, the higher the yields.

In May of the third year, larvae were counted in soil samples from the plots. Only 17 larvae per pint of soil were in samples from plots in the rotation that included cotton, while 270 larvae per pint were in soil from the continuous soybean plot.

Nematodes multiplied rapidly the year soybeans followed cotton. The larvae count increased from 17 per pint of soil in May to 3,280 in October. Where soybeans were grown for 3 years, the count increased to only 568 by October. Root growth was not sufficient to maintain a large nematode population.

After a single rotation of soybeans and a nonhost crop, only one good crop of soybeans can be grown. This was demonstrated when soybeans were planted the fourth year after a soybean-cotton-soybean rotation. The yield was only 5 bushels per acre. A large nematode population developed the third year, seriously affecting soybean production the next year. Evidently, the best yields result from continuous rotation.☆

Technique For Gaging Onion Pungency

■ Producers and breeders of onions and manufacturers of onion products now have an accurate, easily used method for measuring pungency—the most important quality of onions.

The pungency-measuring technique is simply a determination of the amount of pyruvic acid in a slurry of ground onion. Formation of this acid is part of the reaction that forms pungency-creating odor-flavor compounds in onions.

USDA chemists developed the measuring method while conducting research on the precursors, products, and enzymes involved in the formation of odor-flavor in onions. Panels of judges who evaluated the pungency of 25 varieties of onions confirmed validity of the method devised at the ARS Western utilization laboratory in Albany, Calif.

This technique evolved after J. F. Carson and Francis Wong, using gas chromatography, discovered certain sulfur-containing compounds in onion odor-flavor. In a search for onion components that produce odor-flavor substances, they isolated several sulfur-containing amino acids. Two of these could be converted to odor-flavor by an enzyme also found in onions. Sigmund Schwimmer isolated the enzyme and learned that this reaction also produces pyruvic acid. In collaboration with W. J. Weston, he developed the gaging technique.

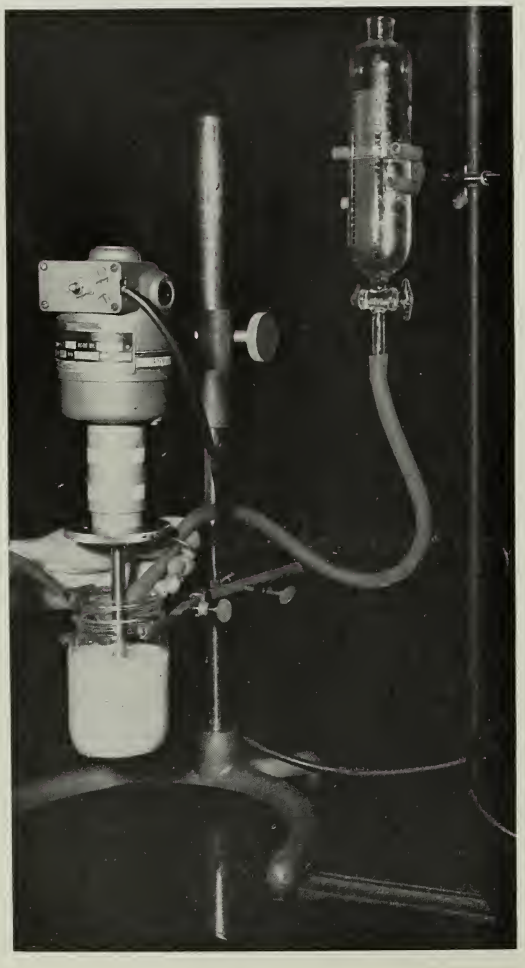
To measure pyruvic acid content, onions are ground and clear juice is successively treated with two reagents—an acid solution of 2,4-dinitrophenylhydrazine and an alkali solution. Red color forms in the juice and its intensity, determined in a colorimeter, indicates the amount of pyruvic acid.

Weak and strong onions differ widely in pungency. Juice of a weak-odored onion, for example, requires dilution to about 20 parts per million in water before odor becomes undetectable. Only about 0.04 percent of such an onion's juice is pyruvic acid. In contrast, a strong-odored onion produces about four times as much pyruvic acid.

Experiments are underway to determine whether the pungency-measuring method is applicable to dehydrated as well as fresh onions.☆

An accurate way to gage the fat-binding capacity of meats used to make bologna and similar products has been developed

Now Sausage-Making Can Be More Precise



Ground lean meat and brine are put in a high-speed mixer. Fat is added until the emulsion that forms suddenly becomes a thin solution.

■ An accurate way of measuring the fat-binding capacity of meat, developed by USDA researchers, can provide more precision and uniformity in sausage-making. Processors need to know the relative abilities of meat proteins to bind fat so as to avoid excessive fat in bologna, frankfurters, and other sausage products.

The measuring method consists of mixing ground lean meat with cold brine in a high-speed mixer, while adding melted fat at a fixed rate. The meat, brine, and fat form an emulsion that continues to thicken as more fat is added. When the fat-binding capacity of the meat protein is exceeded, the thickening emulsion suddenly turns into a thin, watery solution. The amount of fat added to this point provides a measure of the protein's fat-binding capacity.

Emulsion must hold together in casing

Sausage products are made by mixing ground meat, salt and other curing agents, flavoring materials, and ice to form an emulsion. This is packed into a casing and cooked or smoked. The emulsion holds together while the meat fat is bound by the meat protein. If the meat protein cannot bind all of the fat, it separates during the cooking process.

Until now, the selection of sausage meats with enough fat-binding capacity has been a matter of experience and judgment. The new way of making this determination was developed by biochemist C. E. Swift and chemists C. Lockett and A. J. Fryar of the ARS Eastern utilization division, Beltsville, Md.

This new method ties in with other streamlined methods used in sausage-making. Some manufacturers use numerical data to work with many of

the interrelated meat characteristics involved in the process. Using the data, they electronically compute the best and most economical formulas to use, depending upon prevailing meat prices. Now they will be able to include in such calculations the factor of fat-binding capacity.

In addition to its practical value in meat processing, the test for fat-binding capacity has given scientists a tool for learning what meat characteristics determine the property. They know, of course, that the proteins are responsible, but which proteins and to what extent?

Salt-soluble proteins were best binders

To find out, the utilization scientists extracted protein from meat—first with water, then with brine. They diluted these protein extracts with varying amounts of brine and made emulsions of them, just as they had done with the ground meat. The salt-soluble proteins were by far the better fat binders. And their efficiency increased as they were diluted with more brine.

The water-soluble proteins were incapable of binding fat at all, unless diluted with brine. And their efficiency was not appreciably improved by further brine dilution.

Scientists are attempting to learn more

This work indicates that the amounts of soluble proteins in meat—especially the salt-soluble proteins—are critical to the meat's fat-binding capacity. How much of these soluble proteins is actually dissolved during processing, what their specific emulsifying capacity is, and why the salt-soluble proteins are more efficient emulsifiers than the water-soluble ones are yet to be determined.☆

Fresh-Tasting Evaporated Milk?

■ Evaporated milk that tastes and looks like fresh milk when diluted with water may be nearer reality.

In USDA laboratory studies, the addition of polyphosphates—stabilizing compounds added to processed cheese and other foods—prevented gelling and thereby greatly increased the storage life of evaporated milk sterilized by a high-temperature short-time (HTST) process.

In the tests, samples of HTST-sterilized milk concentrates stabilized by polyphosphates kept up to six times longer, without gelling, than unstabilized control samples.

If the HTST method can be used commercially, milk processors may discard the method of sterilization by prolonged exposure to heat. Flavor and color are changed when whole milk is sterilized by prolonged heat exposure.

The HTST process, which sterilizes by applying heat for only 3 to 15 seconds, was developed many years ago by scientists in USDA and industry laboratories. But the process has not been used commercially because the milk gells in storage.

Preventing the gelling of evaporated milk in storage, though an important advance, does not mean a truly stable high-quality product has been achieved, according to chemist Abraham Leviton of the ARS Eastern utilization division, Washington, D.C. It does mean, however, that scientists can now take advantage of the HTST sterilization process to improve evaporated milk.

Since polyphosphates are a chemical food additive, their use in evaporated milk would have to be specifically approved to meet the requirements of pure food laws.

In some tests, Leviton used samples of 2-to-1 concentrates (about double the solids content of whole milk), the same as commercial evaporated milk. He also tried 3-to-1 concentrates, in which the HTST sterilization process increases the gelling tendency.

The HTST-sterilized 2-to-1 concentrates were more than doubled in storage life—to over 9 months—by the addition of polyphosphates. The 3-to-1 concentrates kept 3 to 4 months without gelling, about 6 times longer than similar concentrates without added polyphosphates.☆

SYNTHETIC SOILS FOR TILLAGE RESEARCH

Use of artificial formulations in tests offers an advantage, standardization of conditions

Reaves checks effect of tillage tool on soil. White lines (wet facial tissues) show how soil reacts.

■ Synthetic soils might be more useful than natural soils for developing improved tillage machines.

Artificial soils being developed by a USDA agricultural engineer seem to have qualities, not found in natural soils, that are desirable for precise repeated testing of model tillage machinery.

C. A. Reaves hopes to use standardized natural clays to make synthetic soils without two limitations of natural soils—variations in moisture content and changes in structure. He is working at the National Tillage Machinery Laboratory, Auburn, Ala.

Synthetic soils have not been used before in testing model tillage machines (one-fifth or one-tenth full size). Scientists will have a valuable research tool if they can combine materials that simulate natural soils without their variations in moisture content and breakdown after repeated use. Use of synthetic soils will permit standardization of test conditions.

The amount of moisture in soil materially affects the way it acts when a model tillage machine is tested. In natural soil, evaporation during a series of tests often results in undesirable variations in soil moisture content. When this happens during repeated experiments, scientists cannot accurately compare findings.

And natural soils altered by machine operations cannot be refitted (returned to their former physical condition) easily and quickly.

Reaves is attempting to produce the desired synthetic soils by adapting a procedure previously used by scientists testing military vehicles, soil-moving machinery, and construction equipment.

Fine particles of kaolin, montmorillonite, and bentonite clays are the basic ingredients of synthetic soils in some of the experiments. These clays are mixed with varying amounts of sand and wetting agents. Reaves is trying spindle oil, ethylene glycol, or a mixture of glycerine and water as wetting agents because they don't readily evaporate.☆

Key ARS appointments announced

Three key appointments in USDA regulatory programs have been announced by B. T. Shaw, ARS administrator.

R. J. Anderson is now ARS assistant administrator for regulatory programs. He succeeds C. D. Van Houweling, who has been named assistant director for regulatory activities of the National Animal Disease Laboratory, Ames, Iowa.

F. J. Mulhern, formerly associate director of the ARS Animal Disease Eradication Division, succeeds Anderson as director of ADE.

A native of Marshall, Tex., Anderson joined USDA in 1935. He had much to do with the Mexican-U.S. foot-and-mouth disease eradication effort from 1947 to 1951. He was appointed ADE chief in 1954.

Van Houweling, a native of Pella, Iowa, joined USDA in 1954 as director of ARS livestock regulatory programs and became assistant ARS administrator in 1957.

Mulhern comes from Wilmington, Del. On the ADE staff since 1945, he worked on the foot-and-mouth disease program in the Southwest and led the Federal-State campaign in which vesicular exanthema was eradicated from the United States.

Plywood walls effective in weirs

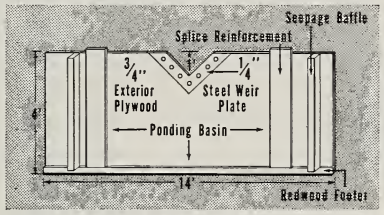
Plywood walls can be used instead of concrete in temporary weirs for gaging the rate of stream flow.

Plywood is especially useful where there is little danger of damage from sediment or debris and the expense and trouble of building permanent weirs aren't warranted.

Wood walls were effective 18 months in temporary weirs tested in eastern Ohio, according to research forester R. Z. Whipkey of USDA's Forest Service. These weirs were installed in well-stabilized stream channels located in protected and undisturbed hardwood forests.

Whipkey used 4 x 8-foot exterior plywood sheets, ¾-inch thick (5 ply), to build the walls. This plywood was overlaid on both sides with waterproof paper.

Whipkey painted all cut edges of the walls with a thin coat of resorcinol (resin-base) glue to protect them from early deterioration. After the glue hardened, he increased protection by treating all surfaces with two coats of water repellent preservative and by applying two coats of marine spar varnish.



Most damage by female boll weevil

Female boll weevils caused approximately three times as much damage to cotton as male weevils in Mississippi experiments.

Females in the tests damaged an average of 10.6 flower buds, or squares, per plant, while the males damaged only 3.5 squares.

Experiments were conducted in August on individual field-grown cotton plants covered with plastic-screen field cages. Some of the trials lasted 4 days, others 5 days.

In number of punctures, females averaged 24.3 and males 5.6 per plant. The punctures made by females included those for feeding and egg-laying. Females made three times as many feeding punctures as males.

Damage by a pair of weevils (a male and a female) was similar to that of one female.

ARS scientists E. P. Lloyd, J. L. McMeans, and M. E. Merkl cooperated with the Mississippi Agricultural Experiment Station, Stoneville.

New design features in house plan

A new USDA plan for a 2-bedroom farmhouse incorporates design features suggested by families that lived in a similar house built in 1952 at the Agricultural Research Center, Beltsville, Md.

ARS agricultural engineers and housing specialists have adhered to their basic design, but there is more inside and outside storage and floor space in the revised plan.

The new plan provides for 1,180 square feet of floor space, about 150 square feet more than the original plan. The dining room, living room, and the kitchen-work rooms have been enlarged. Closet space has been increased by 37 square feet.

Exterior storage space in the wall of the carport is for lawn- and home-maintenance equipment. Luxury features are a covered entrance porch that may be screened and a rear flagstone terrace accessible from the bedrooms and living room.

For economical construction, the house should be built as a unit. However, the design is flexible, and can be used to build a basic house.

Working drawings of this plan (No. 7156) may be obtained from the ex-

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tension agricultural engineer at most State agricultural colleges.

Rotation reduced erosion in corn

Corn planted 1 year, then followed by bermudagrass and crimson clover for 3 years, reduced soil erosion in the corn and increased production of both crops in USDA-Georgia tests.

Erosion in corn was reduced by allowing the grass to form sod after the last corn cultivation.

In the research, 3-year-old coastal bermudagrass and clover sod was plowed in March. Corn was planted after heavy and light diskings. Coastal bermudagrass grew back after the last corn cultivation, forming a good erosion-reducing sod by harvest. Cornstalks were cut after harvest, and crimson clover seed was broadcast. Clover was harvested the next spring and bermudagrass the next summer.

Using this rotation, ARS soil scientist W. E. Adams obtained corn yields averaging 71 bushels per acre, compared with 62 bushels from continuous corn planting.

Three-season total forage production was 11½ tons from the rotation and 9 tons from continuous coastal bermudagrass and crimson clover.

Fertilization included 500-pound-per-acre applications of 0–10–20 before breaking sod, in the row at corn planting, and after seeding clover. Corn was side-dressed at the second cultivation with 80 pounds of nitrogen per acre. Five hundred pounds of 6–10–20 was applied after clover harvest, and 24 pounds of nitrogen was added the next June and July.

The experiments were conducted at the Southern Piedmont Soil Conservation Field Station, Watkinsville, Ga., in cooperation with the Georgia Agricultural Experiment Station.

High-yielding Fairview freezes well

Fairview, a new midseason red raspberry, which yields 10 to 30 percent more berries than varieties now grown in the Pacific Northwest, has been developed by USDA and the Oregon Agricultural Experiment Station.

The new variety is especially suitable for freezing, because the berries retain their bright red color in the retail package. (Some raspberry varieties produce fruit that takes on a purplish, muddy appearance when frozen.) The Fairview raspberry is not suitable for canning.

Plants will be available from cooperating nurserymen next spring. Names of these nurserymen will be furnished by the Oregon station at Corvallis. No plants are available from USDA or the Oregon station.

Collar rot hindering pepper research

An outbreak of collar rot disease has held up attempts to adapt imported black pepper (*Piper nigrum*) to growth in Puerto Rico, but there are good prospects the fungus disease can be overcome.

Efforts to establish black pepper in Puerto Rico are being made to provide a domestic source of this spice, which is obtained from Middle- and Far-Eastern countries. Black pepper can't be synthesized.

Collar rot attacks mature, fruit-bearing pepper plants by infecting the stems at the soil line. To offset this, USDA scientists at Mayaguez, Puerto Rico, grafted selections of imported plants on young rootstocks of native *Piper* species. These haven't been attacked so far, but researchers won't know for sure if the rootstocks have true resistance until the plants start to bear fruit.

Meanwhile, a plant pathologist has isolated the fungus, and tests to determine resistance in pepper plants are being developed.

Until collar rot struck, some selections appeared to be well adapted to Puerto Rico. In experimental plantings, yields were high and the quality of the pepper was excellent. The scientists are propagating these selec-

tions in the greenhouse, to keep the plants free of disease, so they will be useful later for grafting or as breeding stock.

Another disease of test plants—thread blight of stems and leaves—was controlled by application of copper sprays.